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# ORDNANCE TEST ACTIVITY, Yuma, Arizona

ARTILLERY AND AMMUNITION TEST BRANCH

REPORT ON

3300

ARCTIC WINTER ENVIRONMENTAL TEST

OF IGNITER, TIME BLASTING FUSE,

WEATHERPROOF, M60

Report No. DPS/OTA-92

(OMS Code No. 5610.11.701)

(D. A. Project No. 598-09-004)

SUBMITTED:

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GERALD B. PODLIN

APPROVED:

*H. A. Noble*  
H. A. NOBLE  
FOR THE DIRECTOR

61-3-4  
XEROX

JUNE 1961



*Development and Proof Services*

ABERDEEN PROVING GROUND

MARYLAND

REFERENCE COPY

CATALOGED BY ASTIA  
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1.60

U. S. ARMY ORDNANCE TEST ACTIVITY  
Yuma Test Station  
Yuma, Arizona

AUTHORITY: Ltr File ORDEG-DPS-DF,  
dtd 24 October 1960

GEPodlin/pjh/2143

ARCTIC WINTER ENVIRONMENTAL TEST OF IGNITER,  
TIME BLASTING FUSE, WEATHERPROOF, M60

Report No. DPS/OTA-92

Dates of Test: January through 6 March 1961

ABSTRACT

Thirty M60 igniters were tested in groups of ten each after 21, 41, and 55 days of arctic weathering. Twenty-seven of the thirty units functioned satisfactorily. The three failures did fire, but failed to ignite the safety fuse. Control groups consisted of nine igniters stored indoors under moderate conditions and ten placed in arctic storage. All indoor control and nine of the ten outdoor control units functioned satisfactorily. The M60 igniter is considered satisfactory for use under arctic conditions.

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## 1. INTRODUCTION

The development of the M60 weatherproof fuse igniter was originated by OCO in 1953, and consisted essentially of designing a mechanism to effectively and consistently light M700 safety fuse in the air or under water. The new lighter was intended to replace or supplement the M2 fuse lighter which has several shortcomings: namely, insufficient holding power to retain consistently the fuse in the lighter when fired, and the lack of proper sealing for the unit. This resulted in the development of an improved fuse lighter designated T2. Engineering tests conducted in March 1959 at Picatinny Arsenal indicated the T2 fuse lighter to be a satisfactory item able to function and ignite M700 safety fuse after being subjected to any probable environmental or handling conditions. The final version of the T2 lighter (standardized as Igniter, Time Blasting Fuse, Weatherproof, M60) is shown in Figure 1.

## 2. DESCRIPTION OF MATERIEL

The Igniter, Time Blasting Fuse, Weatherproof, M60, is made entirely of nylon except for the firing mechanism. Vents are provided between the firing chamber and the upper body to relieve the pressure build-up caused by the burning primer and fuse, thus preventing fuse "blow-outs". Rubber seals are used at both ends of the lighter to permit firing under water. The unit also provides a quick reset feature permitting the user to quickly reset and refire the lighter in case of a suspected misfire.

An important feature of the M60 igniter is that the firing pin spring is under no load until the actuation is effected.

This feature precludes the possibility of the spring taking a permanent set during storage life, as is conceivable with the M2 for the lighter to be fired accidentally. Details of the igniter assembly are shown in Figure 2.

The M60 fuse igniter is made ready for use in the following manner:

1. Prepare the safety fuse by cutting it cleanly and squarely to expose a freshly cut end.
2. Loosen the plastic cap on the plug sealed end of the lighter by turning the cap counterclockwise for two or three turns. Do not fully remove this cap or parts may become disarranged. Press the plastic plug into the lighter to release the collars. Remove the plastic plug by rotating back and forth as it is retracted.

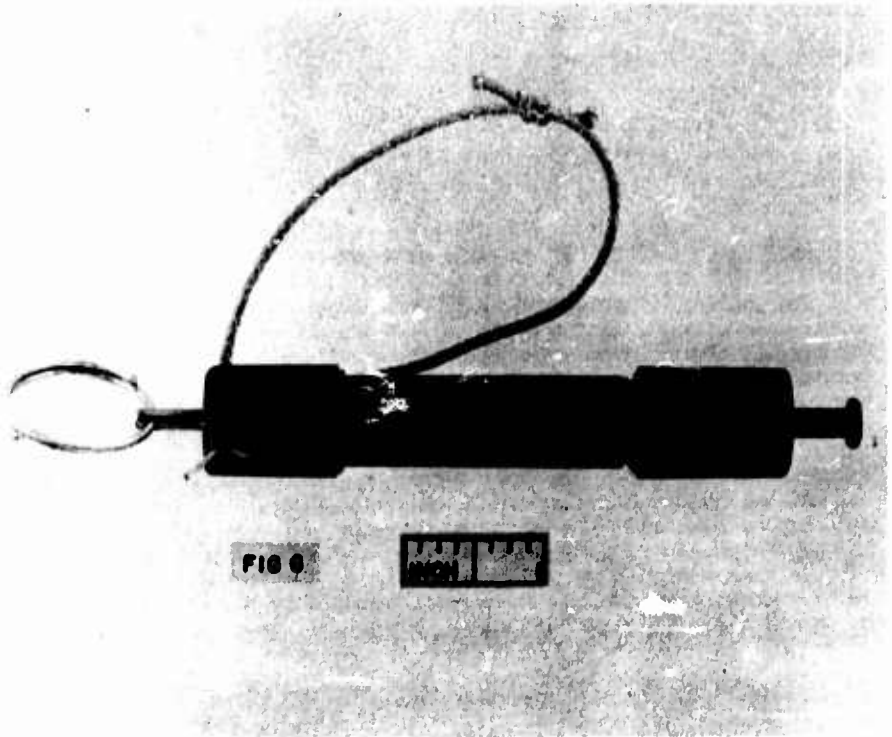


Figure 1 - S02-083-194-1375-93-1TS/ORD-61: T2 Weatherproof Fuse Lighter



# **ASSEMBLY**

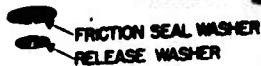
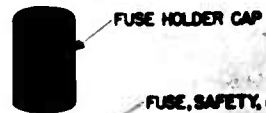
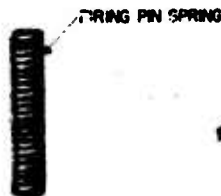
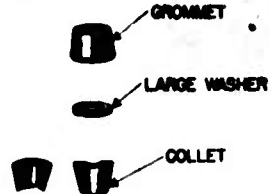
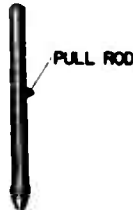
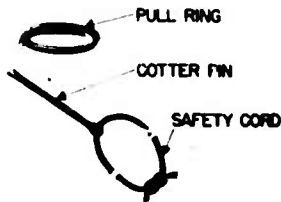


Figure 2 - 302-083-195-1375-93-2TS/ORD-61: Assembly of M60 Igniter

3. Insert the freshly cut fuse and tighten the plastic cap to grip the fuze tight enough to insure a waterproof seal.

4. Remove the safety cotter pin.

5. To fire, withdraw the firing ring until the firing pin is released to fire the primer.

### 3. DETAILS OF TEST

#### 3.1 Procedure

Fifty each Igniter, Blasting Fuse, Weatherproof, T2 (M60), Lot KYC-1-10 and 100 feet of Fuse, Time Blasting, M700 were received at Fort Churchill, Canada, on 12 December 1960 and placed in a transportainer, where they remained through 9 January 1961. On this date all materiel was taken indoors where one foot of safety fuse was affixed to each of the thirty test and to five outdoor control igniters. The procedure was then as follows:

9 January - 5 outdoor control samples tested.

10 January - 30 test samples exposed for arctic weathering.

5 outdoor control samples (in original containers) placed in arctic storage.

12 January - 4 indoor control samples tested.

31 January - 10 test samples tested after 21 days of arctic weathering.

20 February - 10 test samples tested after 41 days of arctic weathering.

6 March - 10 test samples tested after 55 days of arctic weathering.

5 outdoor control samples tested.

5 indoor control samples tested

All control samples had one foot of freshly cut, M700 safety fuse affixed immediately prior to firing. Figure 3 shows the igniters after arctic weathering periods of 21 and 55 days.

The environmental test was conducted in accordance with TP No. AA-18-61C dated 18 October 1960, with the exception that weathering periods were reduced to coincide with the 60-day winter test period.

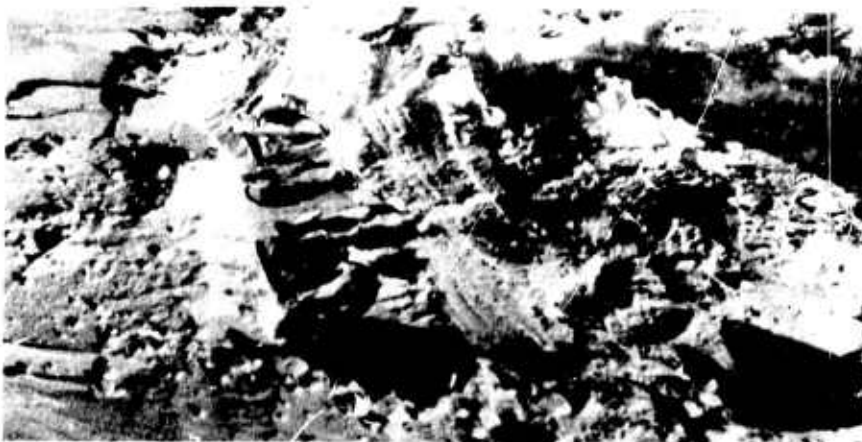


Figure 3 - 802-083-308-1375-93-3TW/ORD-61: Igniters After 21 Days of Arctic Weathering. Bottom - After 55 Days of Arctic Weathering.

### 3.2 Results

The results of testing after various storage periods and conditions are given in Table I.

Table I. Summary of Results

<u>Date of Testing</u>	<u>Storage Conditions</u>	<u>Functioning Performance</u>	<u>Remarks</u>
9 Jan	Outdoor (control)	4 of 5	One igniter failed to fire.
12 Jan	Indoor (control)	4 of 4	None
31 Jan	Weathering (21 days)	9 of 10	One igniter fired, but failed to ignite safety fuse.
20 Feb	Weathering (41 days)	8 of 10	Two igniters fired, but failed to ignite safety fuse.
6 Mar	Weathering (55 days)	10 of 10	None
6 Mar	Outdoor (control)	5 of 5	None
6 Mar	Indoor (control)	5 of 5	None

A summary of the functioning performances under the three types of storage is shown in Table II.

Table II. Summary of Performance Under Three Types of Storage Conditions.

<u>Type of Storage</u>	<u>Satisfactory Functioning</u>
Indoor (control)	9 of 9 - 100 per cent
Outdoor (control)	9 of 10 - 90 per cent
Arctic Weathering (test)	27 of 30 - 90 per cent

The three test units which were unsatisfactory all fired without igniting the safety fuse. Length of arctic weathering periods appeared to have little effect on the functioning characteristics of the system.

All units which fired successfully functioned upon the first firing and the one-foot length of safety fuse burned completely. No difficulties were experienced in the handling and firing of the unit under arctic conditions.

Meteorological data for storage and test periods are included as Appendix B.

### 3. OBSERVATIONS

The primer was removed from the igniter which failed to fire on 9 January and inserted in an igniter previously used, and fired successfully. The person testing this igniter remarked afterwards that the fuse holder cap was not very tight and the primer base may have been too far from the striker assembly. To determine whether the cause of malfunction was due to improper assembly or to a faulty igniter, a primer from one of the indoor control units was inserted in this igniter and the unit was placed in arctic storage to be tested with the remainder of the outdoor control group. When tested on 6 March the igniter again failed to fire. The unit was reset and pulled, with similar results. The igniter was then taken indoors, disassembled, examined, reassembled, and fired successfully. Examination of the igniter parts upon disassembly revealed no defects. Previous failure to fire was probably due to an improper original fitting of the striker assembly.

### 4. CONCLUSIONS

The Igniter, Time Blasting Fuse, Weatherproof, M60 is suitable for use under arctic winter environmental conditions.

### 5. RECOMMENDATIONS

None

#### SUBMITTED:



GERALD B. PODLIN  
Project Engineer

#### REVIEWED:



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Chief,  
Artillery & Ammunition Branch



NICHOLAS R. TOWNSAN  
Major                      OrdC  
Chief, Engineering Testing Division

#### APPROVED:



H. A. NOBLE  
Assistant Deputy Director  
for Engineering Testing  
Development and Proof Services

#### REFERENCES

- a. Technical Memorandum No. 158B52, dated March 1959, Subject: Engineering Test Report on Lighter, Fuse, Weatherproof, T2. Picatinny Arsenal, Dover, New Jersey.
- b. Technical Memorandum No. 83B24, dated May, 1958, Subject: Development Summary and Proposed Engineering Test Program for Lighter, Fuse, Weatherproof, T2. Picatinny Arsenal, Dover, New Jersey

## APPENDICES

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MrOgle/vah/44233

27 Oct 60

ORDBO-DPS-DF

SUBJECT: Winter Test 1960-61 of Igniter, Time Blasting Fuse,  
Weatherproof, M-60

TO: Commanding Officer  
USA Ordnance Test Activity  
Yuma Test Station  
Yuma, Arizona  
Attn: ORDBO-TA-C

1. The attached test program for Winter Test 1960-61 of Igniter, Time Blasting Fuse, Weatherproof, M-60 is approved and forwarded for accomplishment by your activity during the 1960-61 winter test season at Fort Churchill, Manitoba, Canada.

2. The igniters and fuses as required will be included in the consolidated ammunition shipment from Aberdeen Proving Ground to Fort Churchill on or about 1 November 1960.

3. Funds applicable to this test have not been determined. Request a cost estimate be forwarded, at an early date, so that funding arrangements may be finalized prior to starting of test.

4. Normal Project TB5-1401 formal report preparation and distribution will apply, in addition to distribution listed elsewhere in the attached program.

5. Picatinny Arsenal technical memorandum number 158B52 (Inclosure 3 to test program) is on order and will be forwarded by Technical Library, Aberdeen Proving Ground.

FOR THE DIRECTOR:

1 Incl  
TP No. AA-18-610  
dtd 18 Oct 60

BENJAMIN S. GOODWIN  
Associate Director

Copies furnished:  
OCO ORDTD w/Incl; ORDTs w/Incl  
CO, USA OCTD Ft. Churchill w/Incl  
PA Attn: ORDBO-THIO Mr. Milton Resnick w/Incl (dupe)

ENVIRONMENTAL ARCTIC WINTER TESTS, 1960-61  
TEST PROGRAM  
FOR  
IGNITER, TIME BLASTING FUSE, WEATHERPROOF, M-60

1. Object of Test:

To determine whether the Igniter, Time Blasting Fuse, Weatherproof, M-60 is suitable for use under arctic conditions.

2. Background and Present Status

The M-60 weatherproof fuse igniter is intended to replace or supplement the present M2 fuse lighter which has several shortcomings.

The new igniter is made entirely of nylon except for the firing system. Rubber seals are used at both ends of the igniter to permit firing under water. The unit provides a reset feature permitting the user to quickly reset and refire the igniter in case of a misfire. Additional descriptive information is contained in the references.

The T2 fuse lighter (standardized as igniter, time blasting fuse, M-60) was subjected to ten tests during the engineering test. Results of these tests indicate that the design is satisfactory. Details may be found in Reference 2.

3. Test Ammunition

50 each, Igniter, Time Blasting Fuse, Weatherproof, M-60 (Items to be furnished by Picatinny Arsenal)

50 feet of M700 safety fuse.

4. Test Procedure

a. A control group of ten units will be stored indoors under moderate conditions.

b. A control group of ten units, plus the remaining thirty test samples will be stored under arctic storage conditions.

c. After a period of two weeks, remove the test samples, affix a freshly cut one foot length of M700 safety fuse to each igniter, and emplace the items for arctic weathering. Details of emplacement are left to the discretion of test personnel. At the same time, remove ten control samples from storage (five from indoor storage and five from arctic storage). Affix a one foot length of fuse to these items and attempt to function the igniters.

d. After weathering periods of 30, 60 and 90 days, attempt to function ten of the test samples. While testing the final ten samples that have weathered for 90 days, remove the remaining control samples from storage and attempt to function the igniters as per paragraph c.

5. Observations to be Recorded

a. Storage and ambient temperatures at appropriate times and places throughout the test period.

b. Effects of the environment on the function ability of the test samples.

c. Comments of personnel engaged in the test activity regarding the usability of the item under arctic conditions.

d. Photographs where appropriate.

6. A test plan will not be required.

7. A formal report will be submitted at the conclusion of the test activity. This report will be unclassified.

8. Report Distribution - See Inclosure 1

- References:
1. Picatinny Arsenal Technical Memorandum No. 83B24 (Inclosure 2)
  2. Fourth Report on Ord Project TS1-400. "Final Engineering Tests of Lighter, Fuse, Weatherproof, T2 (Inclosure 3)
  3. Picatinny Arsenal Technical Memorandum No. 158B52

3 Incls  
a/s

**DISTRIBUTION**

**Chief of Ordnance  
Department of the Army  
Washington 25, D. C.  
ATTN: ORDTS**

**Commanding Officer  
Picatinny Arsenal  
Dover, N. J.  
ATTN: ORDBB-TTC  
Tech Ref Section**

**Commanding General  
Ordnance Ammunition Command  
U. S. Army  
Joliet, Illinois**

**CONARC Liaison Office  
Aberdeen Proving Ground, Md.**

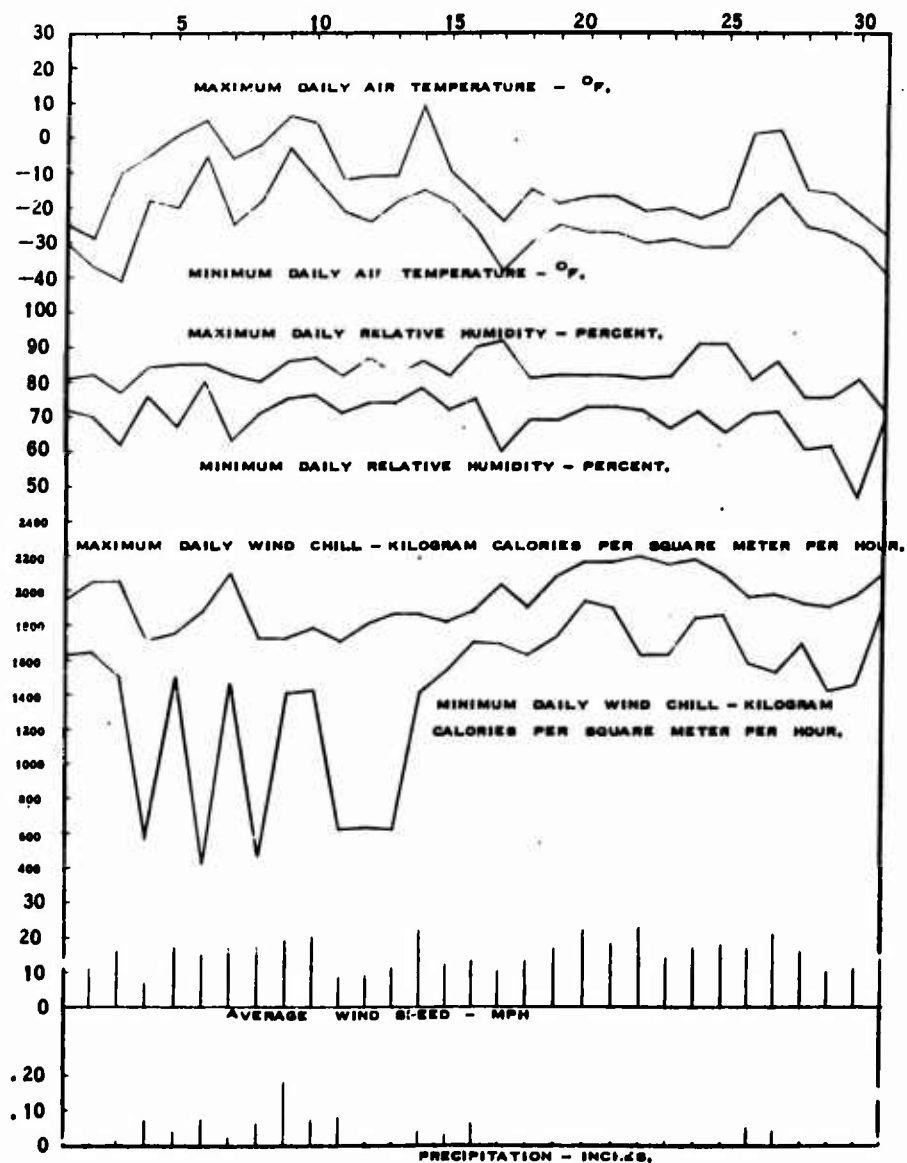
**The Engineer School  
U. S. Army  
Ft. Belvoir, Virginia**

**Technical Library Branch  
Aberdeen Proving Ground, Md.**

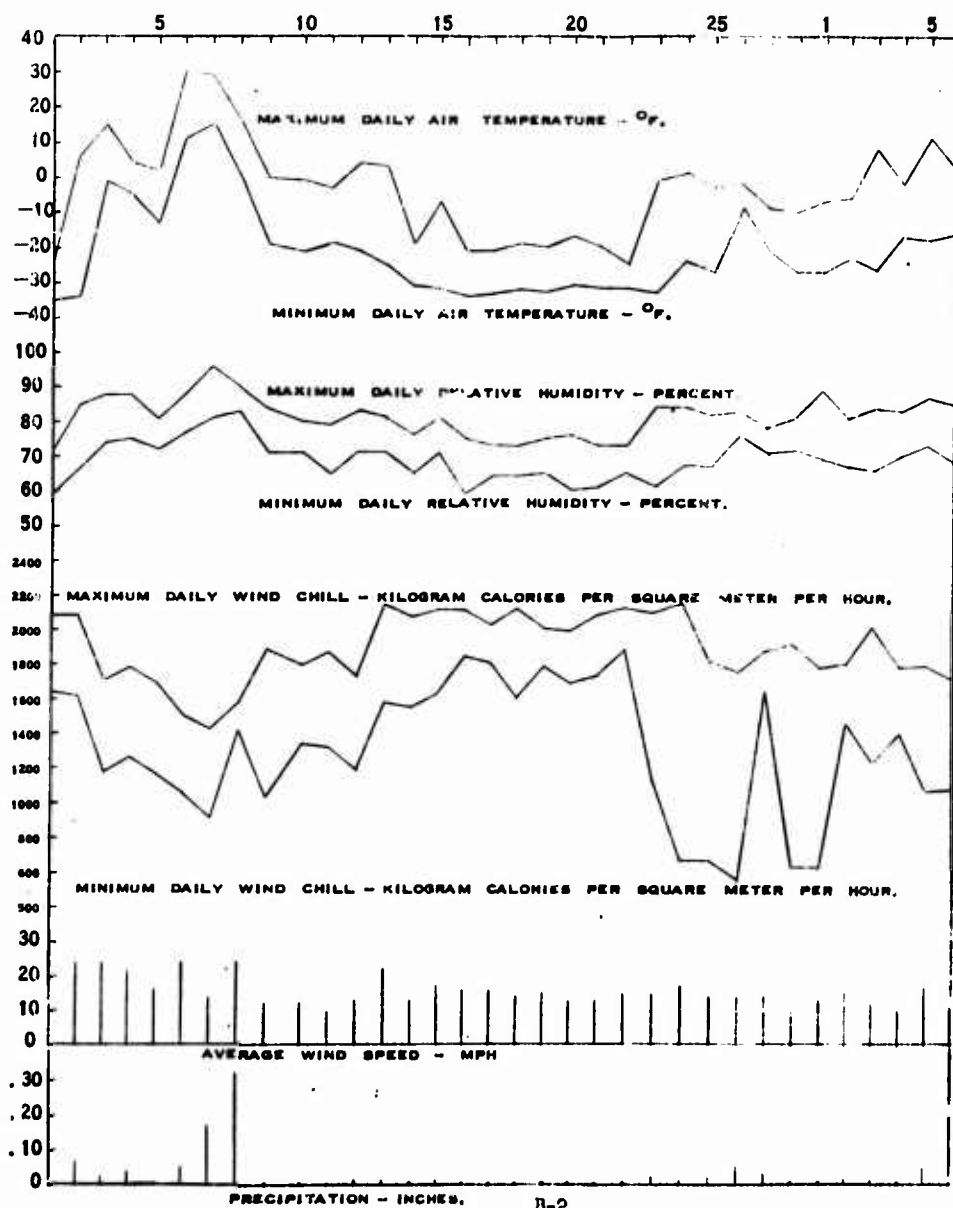
**Inclosure 1**

# APPENDIX B

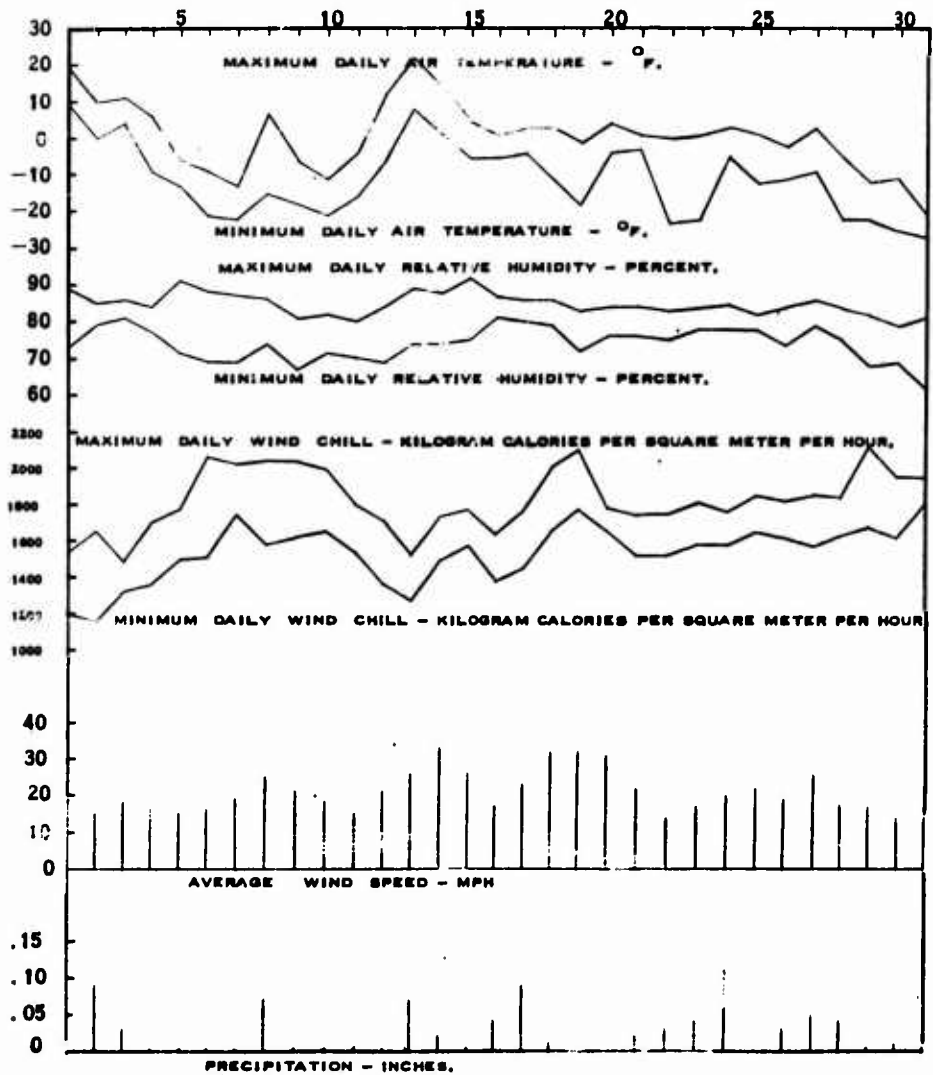
## FORT CHURCHILL, MANITOBA, CANADA METEOROLOGICAL SUMMARY, JANUARY 1961



FORT CHURCHILL, MANITOBA, CANADA  
METEOROLOGICAL SUMMARY, FEBRUARY AND MARCH 1961



**FORT CHURCHILL, MANITOBA, CANADA  
METEOROLOGICAL SUMMARY, DECEMBER 1960**



# RECORD OF PERFORMANCE DATA SHEET

## ARCTIC-WEAPONS

EQUIPMENT TESTED: Igniter, Time Blasting Fuse,  
Weatherproof, M50

FACILITIES Safety Fuse, Time Blasting, M100

NOTES

Report No. JPL/CS-92

Location and Date of Test  
Carnegie, Michigan,  
LEAD: 9 Jan thru 6 Mar 53

1. General Remarks

2. Comments

3. Remarks

4. Remarks

5. Remarks

6. Remarks

7. Remarks

8. Remarks

9. Remarks

10. Remarks

11. Remarks

12. Remarks

13. Remarks

14. Remarks

15. Remarks

16. Remarks

17. Remarks

18. Remarks

19. Remarks

20. Remarks

21. Remarks

22. Remarks

23. Remarks

24. Remarks

25. Remarks

### PERFORMANCE FACTORS

1. Accuracy

2. Reliability

3. Durability

4. Maintainability

5. Portability

6. Safety

7. Cost

8. Weight

9. Size

10. Power

11. Range

12. Accuracy

13. Reliability

14. Durability

15. Maintainability

16. Portability

17. Safety

18. Cost

19. Weight

20. Size

21. Power

22. Range

23. Accuracy

24. Reliability

25. Durability

### ENVIRONMENTAL FACTORS

1. Temperature

2. Humidity

3. Wind

4. Rain

5. Snow

6. Fog

7. Ice

8. Salt

9. Dust

10. Sand

11. Gravel

12. Rock

13. Soil

14. Vegetation

15. Animals

16. Man

# APPENDIX D

## Distribution

<u>NAME AND ADDRESS</u>	<u>NO. COPIES</u>	<u>NAME AND ADDRESS</u>	<u>NO. COPIES</u>
Chief of Ordnance Department of the Army Washington 25, D. C. ATTN: ORDTB ORDTS	1 1	Commanding Officer Engineering R&D Labs Fort Belvoir, Virginia ATTN: Tech Doc Center	1
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Commanding Officer Diamond Ord Fuze Lab Washington 25, D. C. ATTN: ORDTL 012	1	Commander British Army Staff British Defence Staff (W) 3100 Massachusetts Ave, NW Washington 8, D. C. THRU: OCO-ORDGU-SE	2
Commanding Officer Picatinny Arsenal Dover, New Jersey ATTN: Climatic Test Coordinator 1 ORDBB-TF6	1 1	Canadian Army Staff 2450 Massachusetts Ave, NW Washington 8, D. C. ATTN: GSO-1, A&R Section THRU: OCO-ORDGU-JE	2
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Commanding Officer Frankford Arsenal Philadelphia 37, Pennsylvania ATTN: CC 1730/230		Commanding Officer US Army Res Ofc (Durham) Box CM, Duke Station Durham, North Carolina ATTN: Engr Sciences Div	1
Southwest Res Institute 8500 Culebra Road San Antonio 6, Texas ATTN: Mgr, Envir Res Sec	1	CONARC Liaison Office Aberdeen Proving Ground Maryland	3
Commanding General Ordnance Ammunition Command Joliet, Illinois ATTN: ORDLY-AI-T	1	Navy Liaison Office Aberdeen Proving Ground Maryland	1
Commanding General Ordnance Weapons Command Rock Island, Illinois ATTN: ORDOW-FM ORDOW-TB	1 1	Technical Library Aberdeen Proving Ground Maryland	Vellum 1 Ref 1 Rec

AD Accession No.  
OTA, Yuma Test Station, Yuma, Arizona  
ARCTIC WINTER ENVIRONMENTAL TEST OF  
IGNITER, TIME BLASTING FUZE, WEATHER-  
PROOF, M60 Gerald B. Podlin

Report No. DPS/OTA-92, June 1961  
ONS Code No. 5610.11.701  
DA Proj No. 598-09-004  
Unclassified Report

The effects of arctic winter environment on the functioning ability of Igniter, Time Blasting Fuse, Weatherproof, M60 was determined. Twenty-seven of the thirty units tested functioned satisfactorily. The M60 igniter is considered satisfactory for use under arctic conditions.

AN Accession No.  
OTA, Yuma Test Station, Yuma, Arizona  
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PROOF, M60 Gerald B. Podlin

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AD                      Accession No. \_\_\_\_\_  
OTA, Yuma Test Station, Yuma, Arizona  
ARCTIC WINTER ENVIRONMENTAL TEST OF  
IGNITER, TIME BLASTING FUZE, WEATHER-  
PROOF, M50                      Gerald B. Podlin

Report No. DPG/OTA-92, June 1961  
ONS Code No. 5610.11.701  
DA Proj No. 598-09-004  
Unclassified Report

The effects of arctic winter environment on the functioning ability of Igniter, Time Blasting Fuse, Weatherproof, M50 was determined. Twenty-seven of the thirty units tested functioned satisfactorily. The M50 igniter is considered satisfactory for use under arctic conditions.

AD                      Accession No. \_\_\_\_\_  
OTA, Yuma Test Station, Yuma, Arizona  
ARCTIC WINTER ENVIRONMENTAL TEST OF  
IGNITER, TIME BLASTING FUZE, WEATHER-  
PROOF, M50                      Gerald B. Podlin

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